



## *Course contents for embedded training*

### **Module 1: Basic Electronics**

#### **1. Fundamentals of Electronics**

- What is Electronics?
- Voltage
- Current
- Power
- Frequency
- Understanding Ohm's Law
- Basic Network Theory and its relations
- Types of Materials
  - o Conductor
  - o Super-Conductor
  - o Insulator
  - o Semiconductor
- Battery
- Transformers

#### **2. Basic Electronic Circuit Components**

- Resistors
- Capacitors
- Inductors
- Diodes
- Transistors
- Relays
- Light Emitting Diodes
- LDR
- Optoisolators
- Operational Amplifiers

### **3. Fundamental Concepts of Digital Electronics**

- Overview of digital gates
- Switching Theory
- Different designs using digital gates
- Number Systems and Codes
- Digital Logic Families

## **Module 2: 8051 MicroController**

### **1. Understanding Embedded Systems**

- Overview of Processors & Microcontrollers
- Memory (RAM, ROM, EPROM, EEPROM, FLASH)
- I/O Interfaces
- Host & Target Development environment
- Cross Compilers
- Downloading Techniques

### **2. 8051 Microcontroller**

- Architecture
- Addressing modes
- Instruction Set
- Assembly and C Language Programming

### **3. Fundamentals of C**

- Data types and Constants
- Memory Usage
- Operators & Expressions
- Loops
- Functions
- Arrays

### **4. Embedded System Programming**

- Embedded Systems Design Issues
- Challenges and Trends in Embedded Systems
- Assemblers, Compilers, Linkers, Loaders, Debuggers
- Interrupt Handling in C
- Combining C with Assembly

## 5. Microcontroller Peripherals

- I/O port
- ADC
- Timers
- USART
- PWM
- Interrupt

## 6. Microcontroller Interfacing

- LEDs
- Switches
- Relay
- Real Time Clock
- ADC
- DAC
- Temperature Sensor
- Humidity Sensor
- Pressure Sensor
- IR Sensor
- Ultrasonic Sensor
- RF Modules
- Serial Communication
- LCD
- GSM
- GPS

## **Module 3: ARM LPC2148 Processor**

### 1. INTRODUCTION TO ARM PROCESSOR

- Introduction to embedded system and ARM Processor.
- ARM related Companies and its opportunities.
- ARM processor family.
- Application of ARM Processor.
- Compiler.
- Emulation and Debugging.
- Difference between RISC & CISC.

## 2. LPC2148 MICROCONTROLLER PIN DETAILS, MEMORY

- LPC2148 ARM 7 microcontroller.
- Features of LPC2148.
- Block diagram of LPC2148.
- Pin diagram of LPC2148.
- Architectural overview.
- On-chip flash program memory.
- On-chip static RAM.

## 3. SYSTEM CONTROL

- Crystal Oscillator.
- PLL.
- Reset and Wake-up Timer.
- Brownout detector.
- Code Security.
- External Interrupt input.
- Memory Mapping Control.
- Power Control, VPB.

## 4. MEMORY MAP, PIN CONNECT BLOCK, GPIO

- Memory map.
- Pin Connect Block.
- General Purpose Parallel I/O: Features
- 8 Bit LED's and switches
- Relay and Buzzer
- Seven Segment Led
- Keypad
- LCD

## 5. TIMER, ADC, DAC, UARTs

- General purpose timer/ External event counters : Features
- Interfacing Timer and Counter Operation.
- 10-bit ADC: Features
- Interfacing Temperature Sensor LM35.
- 10-bit DAC: Features
- Interfacing DAC.
- UARTs: Features, Serial Communication.

- Interrupt Controller.
- Interrupt Sources.
- External Interrupt.

## 6. I2C, SPI, PWM, RTC, WATCHDOG TIMER

- I2C – bus serial I/O Controller : Features
- Interfacing with AT24C1024.
- SPI- Serial I/O Controller : Features
- Interfacing with 25LC040.
- Watchdog timer : Features
- Real Time Clock : Features
- Pulse Width Modulator : Features
- PWM.

## 7. MEMORY CARD INTERFACING

- LPC 2148 Interfacing with SD Memory card



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